Static Deformation Working Group

Test Case 1

Version 3
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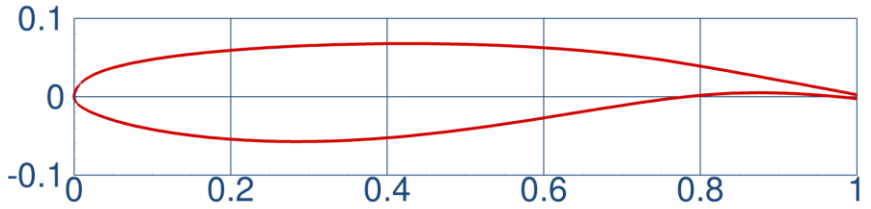
Test Case 1a: ONERA OAT15A Geometry & Data

- **Geometry is available here: (it is very strongly desired to use the provided IGES file in the ONERA OAT15A zip file and not the raw coordinates)**
  https://aiaa-dpw.larc.nasa.gov/geometry.html
- **Committee-supplied RANS grids are available here**
  https://aiaa-dpw.larc.nasa.gov/grids.html
- **Experimental data are available here**
  https://aiaa-dpw.larc.nasa.gov/experiment.html

Test Case 1a: Workshop-Wide Validation

Jaquin, et al. "Experimental Study of Shock Oscillation over a Transonic Supercritical Profiles." AIAA Journal, Vol. 47, No. 9, 2009. Pages 1985-1994.



ONERA OAT15A Transonic Airfoil

- **Validation of steady CFD analysis, required**
- **Users are encouraged to employ best practices**
- **Settings**
  - Steady CFD (e.g., RANS)
  - Prefer some version of SA, multiple turbulence models can be submitted
  - Use periodic boundary conditions for sidewall boundary conditions
- **Grids**
  - Six-member grid family; four are required, six are desirable
  - Encourage use of committee-supplied grids; user-generated grids are acceptable
  - Three committee-supplied once-cell-wide grid topologies are provided
- **Conditions**
  - Mach 0.73, Re_c=3m (based on chord length), T_{static}=271 K (487.8 R)
  - Alpha: 1.36, 1.50, 2.50, 3.00, 3.10
  - Experimental conditions (for reference): P_{total}=102.4 kPa; P_{static}=71.8 kPa

Test Case 1a: Data Submission

- **Please follow these instructions**
  https://aiaa-dpw.larc.nasa.gov/postprocessing.html
- **Required data**
  - Forces and Moments
    `DPW8-AePW4_ForceMoment_v4.dat`
  - Surface cuts
    `DPW8-AePW4_SectionalCuts_v4.dat`
    Use `sectionalCutter-v1.mcr`
  - Convergence data
    `DPW8-AePW4_Convergence_v4.dat`
  - Contour plots
    Use `airfoilImages-v1.mcr`
  - Boundary layer profile data (in work)

Test Case 1b: NASA CRM Geometry & FEM

- These files are in work
- More will be posted in the future

Test Case 1b: NASA CRM FEM Validation

- **Validation of Structural Model for NASA CRM**
  - Tap Test planned for comparison to normal mode solutions of FEM models
  - Static Loads Tests will be conducted to compare deflection measurements (and maybe twist) to Linear Static FEM solutions
- **Users are encouraged to employ best practices for selected FEM codes**
- **Settings**
  - Linear Eigenvalue Analysis (e.g. NASTRAN® SOL103)
- **Conditions**
  - Rigid suspension at sting
- **Grid**
  - MSC NASTRAN® solid 4-node tetrahedral finite-element structural model
  - Model consists of $6.8 \cdot 10^6$ elements, $4.1 \cdot 10^6$ degrees-of-freedom
  - Supplied by NASA Langley's Configuration Aerodynamics Branch
  - Wind tunnel sting will be added as beam model (date ???)

NASA CRM
Structural Model

Test Case 1b: Data Submission (In Work)

- **Please follow these instructions**
  https://aiaa-dpw.larc.nasa.gov/postprocessing.html
- **More information coming**

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